Period Doubling Cascade in Diffusion Flames

Milan Miklavčič
Department of Mathematics, Michigan State University, East Lansing, MI 48824-1027
milan@math.msu.edu

Abstract:
Here it is shown that chaotic oscillations can appear after a series of period doublings in radiating diffusion flames when the activation temperature is high enough. It is also shown that period doubling cascades appear typically in very small regions and that they may not be observable if one starts with small perturbations of a steady flame.

Published in *Combustion Theory and Modelling* **11**(2007), 103-112.
Here is the whole article in the PDF format.

Some of my other publications related to diffusion flames:

1. Oscillations and Island Evolution in Radiating Diffusion Flames, with A. Moore and I. Wichman, *Combustion Theory and Modelling* **9**(2005) 403-416.
2. On stability of one-dimensional diffusion flames, with R. Vance and I.S. Wichman, *Combustion Theory and Modelling* **5**(2001) 147-161.

Some of my work on other applications:

1. Optimal overlap length in staggered architecture composites under dynamic loading conditions, *Journal of the Mechanics and Physics of Solids* **61**(2013), 145-160. With Abhishek Dutta, Srinivasan Arjun Tekalur.
2. The flow due to a rough rotating disk, *Z. angew. Math. Phys. (ZAMP)* **54**(2004) 235-246. With C.Y. Wang.
3. Layered Von Karman's swirling flow, *J. Math. Anal. Appl.* **294**(2004) 24-33.
4. On Nonlinear Stability of Maxwellian states for discrete velocity models of the extended Boltzmann equation, *J. Phys. A: Math. Gen.* **31**(1998) 5393-5400. With G. Spiga.
5. Stability of Maxwellian states for the Broadwell model of the extended Boltzmann equation, *Z. angew. Math. Phys. (ZAMP)* **49**(1998) 590-601. With G. Spiga.
6. Impulsive stretching of a surface in a viscous fluid, *SIAM J. Appl. Math.* **57**(1997) 1-14. With Q. Du, C.C. Chang and C.Y.Wang.
7. State Space Representation of the Nonself-Adjoint Acoustic Duct System, *Journal of Vibration and Acoustic*, **112**(1990), 483-488. With A.J. Hull, C.J. Radcliffe, C.R. MacCluer.

8. A natural modal expansion for the flexible robot arm problem via a self-adjoint formulation, *IEEE Transactions of Robotics and Automation*, **6**(1990), 601-603. With Y. Chait, C.J. Radcliffe, C.R. MacCluer.

9. The temperature stability of a radiant slab-on-grade *ASHRAE Transaction*, **95**(1989). With C.R. MacCluer, Y. Chait.

10. A truncated model for control of a flexible robot arm *Proceedings of the 19th annual Pittsburg conference on modeling and simulation*, May 1988, 2051-2055. With Y. Chait, C.J. Radcliffe, C.R. MacCluer.

11. Non-linear plasma oscillations, *Proceedings of Mathematical Aspects of Fluid and Plasma Dynamics*, edited by C. Cercignani, S. Rionero, M. Tessarotto, Trieste (1985). With P.F. Zweifel, C. Burnap, B.L. Willis.

12. Linear and nonlinear plasma oscillations, *Il Nuovo Cimento*, **87A**(1985), 162-173. With P.F. Zweifel, C. Burnap, B.L. Willis.

13. Single-mode saturation of a linearly unstable plasma *Phys. Fluids*, **28**(1985), 110-115. With P.F. Zweifel, C. Burnap, B.L. Willis.

14. Pressure corrections in measurements of energy accommodation coefficients *Int. J. Heat Mass Transfer* **23**(1980), 1279-1302. With I. Kuščer.

15. Generalized Maxwell method for solving kinetic boundary-value problems *Proc. Conf. Oberwolfach 1979*, edited by D.C. Pack and H. Neunzert Mathematical Problems in the Kinetic Theory of Gases, pp. 113-128. With I. Kuščer.